

**Teaching beliefs and teaching styles of mathematics teachers and their relationship
with academic achievement**

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Abstract

The purpose of this study was to study the relationship between beliefs and teaching styles of teachers of mathematics and their students' academic performance in high schools of Yucatan. For this purpose, a questionnaire was administered to 72 high school mathematics teachers and the student academic achievement score of 1241 were used. A significant relationship between beliefs about constructivist teaching and each of the five categories of teaching styles of teachers of mathematics were found, and also relationship between teaching style "Delegator" and student academic achievement were found. It was concluded that mathematics teachers maintain consistency between what they believe and how they teach, so it is important to maintain correspondence between the teaching style and belief system to achieve a satisfactory effect in mathematics and the teaching style "delegator "is associated with better academic performance in mathematics.

Key words: teaching beliefs, teaching style, mathematics teachers, and academic achievement.

Introduction

Much of the work on school achievement has been developed in developing countries, and recently a great number of studies have been realized in Latin America (Schifelbein, Vélez and Valenzuela, 1994). In the last years in Mexico there has been realized a great number of studies related to academic achievement of the students and diverse strategies have been implemented to improve the student learning, nevertheless, little it has been advanced.

Mexico is located in the last place of 30 countries that integrate the Organization for Economic Cooperation and Development (OECD) with regard to academic achievement in science, reading and mathematics, as aimed at the report of the Programme for International Student Assessment (PISA). The OCDE evaluation was applied in 2006 in 57 countries to 15-year-old pupils. In Mexico, 30 thousand students realized the test: In mathematics Mexican students have improved because in 2003 they obtained 385 points and in 2006 they scored 406 points; however student math achievement continues below of the mean of the OECD (OCDE, 2006).

Since the decade of the 80s research on beliefs has experienced a large impulse. Research developed by McLeod (1988) has shown that the affective domain plays a fundamental role in teaching and learning mathematics (Gómez-Chacón, 2000).

Research over of teachers' beliefs has developed in the general pedagogy and the educational mathematics, constituting a fundamental element in the educational practice in the classroom. During the last years, considerable time and effort has gone into developing and implementing educational reforms. However, recent research on beliefs indicates that teachers are crucial change agents leading to educational reforms and those teacher beliefs have impact to teacher behavior (Ajzen and Fishbein; 1980; Pajares, 1992). We approached this study from the general pedagogy.

A classic study and indispensable reference on having approached the topic of beliefs and teaching styles was realized by Thompson (1984). This author analyzed the relationship between teacher's beliefs of teachers of mathematics and their teaching style using a case study research method in the study of three teachers of mathematics based on Robert Stake's ideas. His more important find was that the beliefs, points of view and preferences of the teacher are important at the moment of realizing their educational practice.

The purpose of this study was to examine the relationship between teacher's beliefs and teaching styles of high school teachers of mathematics in Yucatan, Mexico and student achievement. The study was designed to answer the following questions:

1. How is the teaching style of the teachers of mathematics?
2. Are there differences in the teaching style of the teachers of mathematics for gender, age and type of school?
3. Are there relationship between the teaching style of the teachers of mathematics and the academic achievement of their students?
4. How are the teacher's beliefs of the teachers of mathematics?
5. Are there differences in the teacher's beliefs of the teachers of mathematics for gender, age, and type of school?
6. Are there relationship between teacher's beliefs of the teacher of mathematics and the teaching style?
7. Are there relationship between teacher's beliefs of the teachers of mathematics and the academic achievement of their students?

Theoretical framework

Beliefs are idiosyncratic and incontrovertible truths, with very much affective value and evaluative components and they reside in the episodic memory (Nespor, 1987; Gil and De Guzmán, 1993; and Gil and Rico, 2003); in contrast, they are dispositions to the action and the major determinant of the behavior (Brown and Cooney, 1982). Likewise, based on how teachers see the nature of the mathematics, teaching and learning authors like Thompson (1992) and Speer (2005) define beliefs like the conceptions, the personal ideologies, the points of view and the values that direct the practice and orientate the knowledge.

Pajares (1992) considers that attitudes are formed by clusters of beliefs around a particular situation; it means that people act according to what they believe. He considered teacher efficacy, attributions, anxiety, self-concept, self-esteem, and specific subject-matter beliefs are subsets of the term “educational beliefs”.

According to Gómez Chacón (2000), beliefs are based on the experience, in other words, on the opinion that one brings over of the acquired learning and the teaching received.

Based on behaviorist and constructivist learning theories, Benjamin (2003) developed a system of four categories: behaviorist management, behaviorist teaching, constructivist management, and constructivist teaching.

Behaviorist management category is related about to the extent to which the teacher is in charge of discipline, schedule, and physical and social climate of the classroom. An example statement is “It is important that I establish classroom control, before I become too friendly with students”.

Behaviorist teaching category is related to the extent to which the teacher is in charge of planning, directing, and assessing students’ learning. An example statement is “I based student grades primarily on homework, quizzes, and tests”.

Constructivist management category is related to the extent to which the teacher permits students to control their schedules, and physical and social climate of the classroom. An example statement is “I encourage students to solve internal problems independently when doing group work”.

Constructivist teaching category is related to the extent to which the teacher involves students in planning, directing, and assessing. An example statement is “I make it a priority in my classroom to give students time to work together when I am not directing them”.

Based on Piaget, Vygotsky, and others constructivism is a learning theory which posits that the learner must actively construct meaning and the learning process is most influenced by cognition. On the contrary, behaviorism is a learning theory based on conditioning by reinforcement. Many teacher education programs and many teaching training programs are based on a constructive perspective (Benjamin, 2003). Many teachers are incorporating teaching methods and strategies based on constructive theories of learning in their courses (Richardson, 1997; and Benjamin, 2003). Nevertheless most of them can assume that many of their students are more comfortable with beliefs based on behaviorist theories. Therefore, many teachers believe that it is important for them use constructivist approaches from a learners' perspective.

Teaching styles are a multidimensional construct that bases on the way how teachers act in the classroom (Grasha, 2002). According to Eble (1980) teaching style is represented by those personal qualities and behaviors that appear conducting our classes.

There are different approaches to examine our styles as teachers. Teaching style is a manner or mode of acting or performing. According to this point of view, Lowman (1995) developed a study of the teacher behaviors and found two categories: intellectual excitement and interpersonal rapport, both categories occur to varying degrees in teaching style, in other words, teachers who are strong on both dimensions are generally excellent, while teachers who are deficient on both dimensions tend to be ineffective and unable to present material or to motivate their students.

A second approach associates people with a particular teaching method. Based on this idea, Bonwell and Eison (1991) used the level of active learning and the level of risk to classify teaching style.

A third approach of teaching style should be based upon a conceptual base that forms our philosophy of teaching. It also should be embedded in a conceptual context that includes principles of teaching and learning in order to provide a coherent theoretical structure. Grasha (2002) focused in determining what qualities a teacher must have for a variety of disciplines and what changes that happen in the classroom are related to the styles of learning of the students. He developed a system of five different teaching styles: Expert, Formal Authority, Personal Model, Facilitator and Delegator. Each style differs in the form how the teachers developed in classroom and in the form of interaction that they support with their students.

Teachers as experts possess knowledge and expertise that students need. They are concerned with transmitting information and ensuring is well prepared (Grasha, 2002). An example statement is "Sharing my knowledge and expertise with students is very important to me".

Teachers as formal authority possess status among students because of their knowledge and role as a faculty member. They are concerned with the correct, acceptable, and standard ways to do things and with providing students with the structure they need to learn (Grasha, 2002). An example statement is “I set high standards for students in this class”.

Teachers with personal model believe in teaching by personal example and they establish a prototype for how to do think and behave (Grasha, 2002). An example statement is “Students are encouraged to emulate the example I provide”.

Teachers as facilitators emphasize the personal nature of teacher-student interactions. They work with students on projects in a consultative fashion and try to provide as much support and encouragement as possible (Grasha, 2002). An example statement is “My teaching goals and methods address a variety of student learning styles”.

Teachers as delegators are concerned with developing students’ capacity to function in an autonomous way (Grasha, 2002). An example statement is “Students design one or more self-directed learning experiences”.

Wooley and Wooley (1999) developed and validated an instrument to measure teachers’ beliefs about teaching related to the behaviorist and constructivist learning theories. They collected data from 137 in-service and 61 pre-service teachers to establish construct validity. They realized an exploratory factor analyses using principal components analysis with varimax rotation to determine that four factors offered the best solution.

Woolley, Woolley, and Hosey (1999) examined changes in student teachers’ beliefs related to behaviorist and constructivist learning theories. They administered the TBS to 38 student teachers and 71 of 75 of their cooperating teachers, and they interviewed to 35 of the 38 student teachers. Results indicated that most student teachers were more constructivists and fewer behaviorists than cooperating teachers.

Benjamin, Petersen, Sink, and Walker (2002) examined the Teacher Beliefs Survey (TBS) developed by Woolley and Woolley (1999). They administered the TBS to 446 educators from K-12 grade. They found that different subgroups interpreted the statements differently.

Gales and Yan (2001) examined the relationship between teachers’ beliefs and instructional practices and the mathematics achievement of their students. They used data from the Third International Mathematics and Science Study (TIMSS) to examine differences between behaviorist and constructivist teachers. They administered a questionnaire to 527 mathematics teachers. Results showed that some teacher beliefs are indicative of behaviorist pedagogy, and other beliefs are indicative of constructivist pedagogy.

Benjamin (2003) revised the Teacher Beliefs Survey (TBS) developed by Woolley and Woolley (1999) using expert opinion. He administered a new TBS version to 371 college freshmen and 290 student teachers. He used a confirmatory factor analysis to examine the construct validity.

Love (2003) investigated the relationship between urban teachers' beliefs and student outcomes. She surveyed 46 out of 244 teachers of African American children. Results indicated that reading achievement significantly related to teachers' beliefs.

Gil and Rico (2003) realized a study over conceptions and beliefs that secondary teachers of Andalusia had regarding teaching and learning mathematics. In addition, Lopez (1996) developed a research centered on learning styles and teaching styles, both variables from the perspective of the teacher, whose aim was to establish a relation of pupils' categories as result of the combination of four variables: 1) intelligence, 2) motivation, 3) skills and learning skills and 4) positive study habits.

Method

This study utilizes a quantitative research paradigm and employs a survey research methodology (Lodico, Spaulding and Voegtle, 2006; Creswell, 2003; Fraenkel and Wallen, 2003) to examine the relationship between teacher's beliefs, teaching style, and students achievement.

We selected a sample of 72 teachers of mathematics of 16 high schools in Yucatan. The sample of teachers of mathematics included 43 men (59.7 %) and 29 women (40.3 %); and 32 teachers were working in public schools (44.4%) and 40 teachers were working in private schools (55.6%). Regarding teachers' age, four teachers were less than 25 year (5.6 %), 30 teachers were between 26 and 34 years (41.6 %), 20 teachers were between 35 and 44 years (27.8 %) and 18 teachers were 45 years or over (25 %); the teachers age mean was 37.2 years old.

We used a questionnaire to gather information of the teachers of mathematics, which was organized in three parts. The first part included personal information such as age, gender, and place of work. The second part was based on the Teaching Style Inventory (Grasha, 2002), consisted of forty statements about teaching style, and used a five point Likert rating scale with a rating of 1 indicating strongly disagree to a rating of 5 indicating strongly agree. The third part is based on the Teachers Beliefs Survey (Benjamin, 2003), consisted of forty-eight statements about teachers' beliefs, and used a five point Likert rating scale with a rating of 1 indicating strongly disagree to a rating of 5 indicating strongly agree.

We used the Alfa of Cronbach coefficient to determine the parts of the questionnaire reliability. The 40 teaching style items reliability was 0.902, and the reliability of the five teaching styles was between 0.537 and 0.730 (See table 1). The 48 teachers' beliefs items reliability was 0.886, and the reliability of the four factors about teachers' beliefs was between 0.537 and 0.730 (See table 2).

Results

Teaching style

We calculated means and standard deviation for each teacher of mathematics on each of the five teaching style factors, and we also calculated frequencies and percentages of teachers with a predominant teaching style. Table 3 shows that the Expert teaching style was the highest mean score (mean = 3.96) and the Delegator teaching style was the lowest mean score (mean = 2.97). As shown in table 4, Expert was the predominant teaching style of most teachers of mathematics (45.8%). We concluded that teachers of mathematics prefer for the Expert teaching style, so this leads us to think that teachers of mathematics consider that knowledge and expertise has very much value and that they are interested in the transmission of the information.

Differences between male and female teachers of mathematics are shown in table 5. It shows that female teachers of mathematics were higher mean scores than male teachers of mathematics in all the five teaching styles. Particularly, female teachers of mathematics showed major difference in Personal Model, Expert, and Facilitator teaching styles. In addition, we used t test for independent groups to verify significant differences between male and female teachers of mathematics about their teaching style. Results show significant differences between male and female teachers of mathematics only on the Personal Model teaching style ($t = -2.29$; $df = 70$; $p = 0.018$). We concluded that women are more likely to down play their expertise and more likely to be a model.

Table 6 shows that teachers between 26 and 34 years old were higher means in most of the teaching styles. Results show that teachers between 26 and 34 years old are more likely to assume the Expert Facilitator, and Delegator teaching styles and teachers 45 or over years old are more likely to assume the Formal Authority style. Additionally, we used a one way analysis of variance to verify significant differences between groups of teachers of mathematics organized by age over their teaching style. We found no significant differences in each five teaching styles.

Differences between teachers of mathematics from public schools and teachers of mathematics from private schools are shown in Table 7. Results show that teachers of mathematics from private schools had higher means in most of the teaching styles than

teachers of mathematics from public schools, in other words, teachers from private schools are more likely to assume the Formal Authority, Personal Model, Facilitator, and Delegator teaching styles while teachers from public schools are more likely to assume the Expert teaching style. We also used a t test for independent groups to verify significant differences between teachers who work in public schools and teachers who work in private schools. We found significant differences in the Facilitator teaching style ($t = -3.26$; $df = 70$; $p = 0.002$), and also in the Delegator teaching style ($t = -2.70$; $df = 70$; $p = 0.009$). In conclusion, teachers from private schools were significant more facilitators and delegators than teachers from public schools.

Teachers' beliefs

We calculated means and standard deviations of the four teachers' beliefs factors. Table 8 shows that teachers of mathematics were more constructivists on teaching (mean = 3.83) and more behaviorists on management (mean = 3.69). According to this, teachers of mathematics involve students in teaching activities which promote that students construct their learning, and give them the opportunity to work together, however, they continue to be in charge of the control and discipline in the classroom.

Differences between male and female teachers of mathematics are shown in table 9. Results show that teachers' beliefs of male teachers were more behaviorists in teaching than teachers' beliefs of female teachers, and teachers' beliefs of female teachers were more constructivists in both teaching and management, and more behaviorists in management than teachers' beliefs of male teachers. Teachers' beliefs of both male and female teachers were more behaviorists in management and more constructivists in teaching. We used t test for independent groups to verify significant differences between male and female teachers over teachers' beliefs, results show no significant difference in each four teachers' beliefs category.

Table 10 shows differences between teachers of mathematics grouped by age over teachers' beliefs. Teachers 25 or less years old were more constructivists in both teaching and management, while teachers over 25 were more behaviorists in management and more constructivists in teaching. We used a one way analysis of variance to verify significant differences between teachers grouped by age over their beliefs and found no significant differences.

Both teachers of mathematics from public schools and teachers of mathematics from private schools were more behaviorists in management and more constructivists in teaching; additionally, teachers' beliefs of teachers from public schools were more behaviorists than teachers' beliefs of teachers from private schools, and teachers' beliefs of teachers from private schools were more constructivists than teachers' beliefs of teachers

from public schools (See table 11). We used t test for independent groups to verify significant differences between teachers from public and private schools about their teacher's beliefs and found significant differences in the teachers' beliefs about constructivist teaching.

The analysis of the academic performance was realized based in the mean score obtained of the courses of mathematics of a group of pupils of every polled teacher. They were 1241 students of 72 teachers in 16 schools. Lest mean score was 44.63 and highest mean score was 84.06; the mean score of all students was 67.17 (SD = 9.11). It was found that only 20 % of the group of students had a mean score less than 60 points.

Correlations

We used the Pearson's correlation coefficient to determine the relation between variables. Table 12 shows correlation coefficients between the five teaching styles and student achievement. We found significant positive correlation between Facilitator teaching style and student achievement ($r = 0.252$); it means that as more Facilitator the teacher is better is the student achievement. We also found significant positive correlation between Delegator teaching style of female teachers and student achievement ($r = 0.422$); it means that as more Delegator is the teaching style of female teacher better is the student achievement. As shown in table 13, we do not find relation between the four teachers' beliefs and student achievement.

Table 14 shows correlations between the five teaching styles and the four teachers' beliefs. We found significant positive correlation between Expert teaching style and the four teachers' beliefs; the highest correlation was with teachers' beliefs about behaviorist teaching ($r = 0.548$). We also found significant positive correlation between Formal Authority teaching style and the four teachers' beliefs; the highest correlation was with teachers' beliefs about constructivist teaching ($r = 0.537$). As well, we found significant positive correlation between Personal Model teaching style and the four teachers' beliefs; the highest correlation was with teachers' beliefs about constructivist teaching ($r = 0.494$). Besides, we found significant positive correlation between Facilitator teaching style and teachers' beliefs about behaviorist teaching, constructivist teaching, and constructivist management; the highest correlation was with constructivist teaching ($r = 0.739$). Finally, we found significant positive correlation between Delegator teaching style and the four teachers' beliefs; the highest correlation was with teachers' beliefs about constructivist teaching ($r = 0.700$). In conclusion, there is significant positive relationship between teaching style and teachers' beliefs.

Discussion

Due to the fact that Expert teaching style was preferred by most the teachers of mathematics and that their beliefs were more related to constructivist teaching and behaviorist management, we can conclude that these teachers continue basing their teaching on behaviorist theories. This results can be explained in terms that Mexican educational institutions have put on special attention in designing and implementing educational training programs to their mathematics teachers that promote in them ideas over constructivism in order that they are putting into practice into their classrooms; nevertheless, it was found certain inconsistency in the teachers among their teaching style and their system of beliefs.

Results agree to Grasha (2002) regarding that Expert teaching style is preferred by teachers when classes are large, students are freshmen, there is time pressure to cover a large amount of material, or teachers have to prepare their students for taking exams; in contrast, Delegator teaching style is more likely to employ in upper-level undergraduate courses and teachers are more willing to take risks. Results also agree to Grasha (2002) about Expert teaching style is more used by teachers teaching mathematics, and partly agree about differences in teaching style between men and women teachers. We believe that women in an authority position are more democratic than men.

Teaching style was positive related to student achievement, in particular, Facilitator teaching style was significant positive related to student achievement ($r = 0.252$); and for women teachers, Delegator teaching style was significant positive related to student achievement ($r = 0.422$). According to this and due to Expert teaching style was preferred by most of the teachers of mathematics, it would partially explain the low student achievement in mathematics due to the teaching style of the teacher.

The results of this study demonstrate the importance of teaching styles and also the importance to connecting them to student achievement. However, it still remains unknown how teaching styles is used in the classroom in general.

Teachers of mathematics were fewer behaviorists and more constructivists in their teaching and more behaviorists and fewer constructivists in their management. It appears that they agree with both behaviorists and constructivist theories of learning. According to this, we concluded that it might be helpful for teachers to focus on when to use behaviorist and constructivist learning theories rather than on the superiority of one theory over the other.

Results of the study partially coincide with the reported by Woolley, Woolley and Hosey (1999), Gales and Yan (2001), and Benjamin (2003) in the way that a positive significant relation was found between teacher beliefs and their teaching styles in several of the studied categories. In this respect, the strongest relation was between Facilitator

teaching style and teachers' beliefs about constructivist teaching ($r = 0.739$). It is possible to assume that when the beliefs of teacher coincide with the respective teaching style it might affirm that congruity exists in the teacher and that this one might be considered to be a prototype of a good teacher, in opposite case on there having no been congruity the teacher might present problems or inconsistencies in his or her performance. The results regarding the positive significant relation between the Facilitator teaching style and student academic performance coincide partly with the reported by Love (2003). This leads us to think that to foment in the teacher a Facilitator teaching style in order to improve student academic performance.

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Table 1
Teaching style factors reliability.

Factor	Items	Reliability	Number of items
Expert	1, 6, 11, 16, 21, 26, 31, 36	.537	8
Formal authority	2, 7, 12, 17, 22, 27, 32, 37	.608	8
Personal model	3, 8, 13, 18, 23, 28, 33, 38	.693	8
Facilitator	4, 9, 14, 19, 24, 29, 34, 39	.730	8
Delegator	5, 10, 15, 20, 25, 30, 35, 40	.537	8

Table 2
Reliability of teachers' beliefs factors.

Factor	Items	Reliability	Number of items
Constructivist teaching	2, 4, 7, 10, 16, 17, 20, 21, 26, 27, 32, 33, 34, 37, 39, 40	.888	16
Behaviorist teaching	1, 6, 9, 12, 15, 28, 29, 31, 41, 44, 47	.452	11
Constructivist management	3, 8, 11, 18, 19, 22, 24, 25, 30, 42, 45, 48	.770	12
Behaviorist management	5, 13, 14, 23, 35, 36, 38, 43, 46	.632	9

Table 3
Means and standard deviation by teaching style.

Teaching style	Mean	Standard deviation
Expert	3.96	0.52
Formal authority	3.61	0.53
Personal model	3.83	0.47
Facilitator	3.65	0.58mean
Delegator	2.97	0.50

Table 4
Frequency and percentage by teaching style.

Teaching style	f	%
Expert	33	45.8
Formal authority	3	4.2
Personal model	12	16.7
Facilitator	8	11.1
Delegator	3	4.2
Combination	13	18.1

Table 5
Means, standard deviation, and t test by gender and teaching style.

Teaching style	Gender				t
	Male		Female		
	Mean	SD	Mean	SD	
Expert	3.90	0.55	4.05	0.48	- 1.20
Formal authority	3.59	0.55	3.65	0.50	- 0.49
Personal model	3.72	0.51	3.98	0.38	- 2.29*
Facilitator	3.58	0.57	3.75	0.58	- 1.25
Delegator	2.95	0.48	2.99	0.54	- 0.31

- Significant difference $\alpha = 0.05$

Table 6
Means and F score by teachers' age and teaching style.

Teaching style	Teachers' age				F
	25 or less	26-34	35-44	45 or over	
Expert	4.00	4.03	3.92	3.89	0.33
Formal authority	3.31	3.63	3.54	3.73	0.86
Personal model	3.75	3.89	3.89	3.67	0.93
Facilitator	3.75	3.77	3.56	3.52	0.96
Delegator	2.59	3.02	2.94	2.99	0.87

Table 7

Means, standard deviations, and t test score by type of school and teaching styles.

Teaching style	Type of school				t
	Public		Private		
	Mean	SD	Mean	SD	
Expert	3.87	0.45	3.95	0.58	0.16
Formal authority	3.53	0.55	3.68	0.51	- 1.17
Personal model	3.82	0.41	3.83	0.53	- 0.10
Facilitator	3.42	0.62	3.84	0.47	- 3.26 **
Delegator	2.80	0.51	3.11	0.46	- 2.70 **

** Significant differences $\alpha < 0.01$

Table 8

Means and standard deviations by teachers' beliefs.

Teachers' beliefs	Mean	Standard deviation
Behaviorist teaching	3.06	0.47
Behaviorist management	3.70	0.54
Constructivist teaching	3.84	0.48
Constructivist management	3.40	0.54

Table 9

Means, standard deviations by gender and teachers' beliefs.

Teachers' beliefs	Gender				t
	Male		Female		
	Mean	SD	Mean	SD	
Behaviorist teaching	3.09	0.46	3.03	0.49	0.49
Behaviorist management	3.69	0.60	3.71	0.45	- 0.17
Constructivist teaching	3.83	0.45	3.85	0.53	- 0.21
Constructivist management	3.38	0.43	3.42	0.52	- 0.38

Table 10

Means and F score by teachers' age and teachers' beliefs.

Teachers' beliefs	Age				F
	25 or less	26-34	35-44	45 or over	
Behaviorist teaching	2.64	3.16	3.12	2.94	2.07
Behaviorist management	3.22	3.81	3.75	3.55	2.06
Constructivist teaching	3.87	3.89	3.76	3.81	0.32
Constructivist management	3.50	3.40	3.32	3.45	0.33

Table 11

Means and t score by type of school and teachers' beliefs.

Teachers' beliefs	Type of school		t
	Public	Private	
Behaviorist teaching	3.08	3.05	
Behaviorist management	3.73	3.67	
Constructivist teaching	3.69	3.95	
Constructivist management	3.35	3.44	

Table 12

Correlation between teaching style and student achievement.

Teaching style	Student achievement
Expert	-0.009
Formal authority	0.151
Personal model	0.047
Facilitator	0.252*
Delegator	0.215

*significant correlation $\alpha = 0.05$

Table 13

Correlation between teaching styles and student achievement for gender.

Teaching style	Gender	
	Male	Female
Expert	-0.032	-0.042
Formal authority	0.120	0.178
Personal model	-0.063	0.117
Facilitator	0.179	0.305
Delegator	0.044	0.422*

*significant correlation $\alpha = 0.05$

Table 14

Correlation between teaching beliefs and teaching styles.

Teaching beliefs		Teaching style				
		Expert	Formal	Personal	Facilitator	Delegator
Constructivist teaching	Pearson's correlation	.519	.537	.494	.739	.700
	Significance	.000	.000	.000	.000	.000
Behaviorist teaching	Pearson's correlation	.548	.431	.327	.252	.365
	Significance	.000	.000	.005	.033	.002
Constructivist management	Pearson's correlation	.513	.506	.444	.704	.676
	Significance	.000	.000	.000	.000	.000
Behaviorist management	Pearson's correlation	.376	.331	.288	.136	.246
	Significance	.001	.005	.014	.253	.037

*significant correlation $\alpha = 0.05$